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Exploring Illness Perception, Medication Adherence, and Glycemic Control Among Type 2 Diabetes Patients

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Abstract

Aims: Despite the availability of various antidiabetic treatments, many individuals with type 2 diabetes mellitus (T2DM) struggle to maintain controlled glucose levels. This study aimed to evaluate illness perception, medication adherence, and glycemic control among patients with T2DM receiving primary healthcare.

Methods: A cross-sectional study was conducted on 265 patients with T2DM from primary healthcare facilities . Data on socio-demographic characteristics, lifestyle habits, and diabetic medical history were collected using a semi-structured questionnaire. The Brief Illness Perception Questionnaire (B-IPQ) assessed diabetes perception, while the 8-item Morisky Medication Adherence Scale (MMAS-8) examined medication adherence.

Results: Significant differences in B-IPQ scores were observed among patient groups based on diabetic medications, complications, and glycemic control ($p<0.05$). MMAS-8 scores also significantly differed among groups based on disease duration, family history of T2DM, and glycemic control ($p<0.05$). Furthermore, HbA1c scores varied significantly across patient groups in terms of disease duration, medications, complications, and family history of T2DM ($p<0.05$). Higher BMI, positive family history of T2DM, insulin use, elevated illness perception, and suboptimal medication adherence were associated with higher HbA1c levels.

Conclusion: Elevated HbA1c levels were associated with higher BMI, positive family history of T2DM, insulin usage, heightened illness perception, and inadequate medication adherence among patients receiving primary healthcare for T2DM.

Keywords: Type 2 diabetes mellitus · Illness perception · Medication adherence · Glycemic control

Introduction

Diabetes mellitus (DM) presents a significant and rapidly growing public health challenge affecting millions of individuals worldwide. According to the International Diabetes Federation, approximately 425 million adults aged 20–79 years, constituting 8.8% of the global population in that age group, are estimated to have diabetes. Notably, the Middle East and North African region exhibit the highest prevalence of DM compared to other regions, The prevalence is projected to increase, making effective management crucial to mitigate complications and mortality associated with the disease. (Papatheodorou et al., 2018)

Achieving glycemic control and preventing early complications are paramount in diabetes management. Self-management practices play a vital role in reducing risks and improving overall health outcomes for individuals with diabetes. Adherence to oral antidiabetic drugs (OADs) is particularly critical in ensuring positive health outcomes, delaying disease progression, and reducing mortality rates. However, studies have shown that adherence to medication regimens among diabetic patients is often suboptimal, posing challenges to effective treatment. (Shahin et al., 2019)

Understanding the factors influencing medication adherence is essential for improving health outcomes in diabetes management. Non-adherence is a complex issue influenced by various factors such as demographic, social, cultural, and health system-related aspects. Illness perceptions, in particular, play a significant role in predicting adherence to self-management behaviors and clinical outcomes, notably glycemic control, in individuals with diabetes. (Dworkin et al., 2010)

Numerous studies have highlighted the association between illness perceptions, medication adherence, and glycemic control in patients with type 2 diabetes mellitus (T2DM). Lower perceptions of consequences, illness identity, and emotional distress, along with higher perceptions of personal control, have been linked to better adherence to diabetes medication and improved glycemic control. Conversely, greater concerns about diabetes and medication-related adverse effects can negatively impact adherence and glycemic control. (Radwan et al., 2017)

Despite the critical role of primary care in diabetes management, limited research has focused on illness perceptions, medication adherence, and their impact on glycemic control among T2DM patients . This study aims to fill this gap by investigating the associations between illness perceptions, medication adherence, and glycemic control (measured by HbA1c levels) in patients with T2DM receiving primary healthcare services. (Morisky et al., 2008)

Subjects and Methods

Study Design and Setting:

A cross-sectional study was conducted within primary healthcare (PHC) facilities

Study Population:

The study included all patients diagnosed with type 2 diabetes mellitus (T2DM) who sought care at PHC facilities during the study period, met the inclusion criteria, and consented to participate.

Inclusion Criteria:

Participants aged 18 years or older, diagnosed with T2DM for at least one year, seeking diabetic medical services at PHC , and willing to participate were included.

Exclusion Criteria:

Excluded were women with gestational diabetes, pregnant women, terminally ill patients, those with severe mental or cognitive disorders affecting communication or comprehension, individuals with visual or hearing impairments hindering communication, and those who declined study participation.

Sampling:

Sample Size:

The sample size aimed to demonstrate a 19.5% prevalence of glycemic control among primary care patients with T2DM. To achieve a 95% confidence interval with a 5% margin of error, the calculated sample size was 241 participants. Allowing for a 10% dropout rate, the final sample comprised 265 participants.

Study Tools:

Participants completed a semi-structured questionnaire administered by interviewers, consisting of three parts:

A. Socio-demographic Characteristics and Medical History:

Information collected included age, marital status, educational level, income, smoking status, and medical history (duration of diabetes, family history of DM, current diabetes medications).

B. The Brief Illness Perception Questionnaire (B-IPQ):

A nine-item questionnaire assessed cognitive and emotional illness representations, comprehensibility, and causal factors.

C. The Eight-item Morisky Medication Adherence Scale (MMAS-8):

This scale evaluated medication adherence, with scores indicating levels of adherence ranging from non-adherence to high adherence.

D. Measurement:

HbA1c levels, BMI, and diabetes-related complications such as retinopathy, neuropathy, and nephropathy were assessed as per standard clinical practices.

The study defined good glycemic control as HbA1c levels below 7%, consistent with American Diabetic Association guidelines.

Translation of Questionnaire

The questionnaire underwent translation into Arabic following accepted guidelines, including back-translation by a bilingual consultant. The back-translated version was then reviewed, modified, and reworded as needed by both translators. Subsequently, three expert opinions validated the questionnaire with no major modifications. A pilot study involving 30 patients assessed the questionnaire's feasibility and reliability, yielding an acceptable Cronbach's α of 0.7.

Outcome Variables

The study's outcome variables included illness perception, adherence to diabetes medication, and glycemic control.

Data Analysis

Data were analyzed using version 20 of the Statistical Package for Social Sciences (SPSS). Descriptive statistics were presented as means, standard deviations (SD), or medians, interquartile ranges (IQR) for continuous variables, depending on the sample distribution, and tested using the Shapiro–Wilk test. Categorical variables were presented as percentages. The Mann–Whitney test and Kruskal–Wallis test were used to assess differences in illness perception scores, adherence scores, and hemoglobin A1C levels between groups. Logistic regression and hierarchical multiple linear regression were employed to explore factors associated with adherence to diabetes medication and HbA1c levels, respectively. Statistical significance was set at $p < 0.05$.

Results

Demographic and Illness Characteristics of Diabetic Patients with Differences in Perception, Adherence, and Glycemic Control Total Scores

The study included 265 diabetic patients with a mean age of 58.8 years (SD=9.8), with 60.4% aged between 45–65 years. Most patients were female (58.5%), married (66%), had secondary or university education (70.2%), and reported sufficient income (53.2%). The majority were non-smokers (70.6%), had a mean BMI of 34.1 (SD 6.7), with 27.2% classified as overweight and 63.4% as obese. The average duration of diabetes since diagnosis was 9.7 years (SD=5.8). Oral medications were prescribed to 54.3% of patients, and 44.2% reported diabetes-related complications, including cerebrovascular diseases, retinopathy, nephropathy, and neuropathy. A positive family history of T2DM was reported by 60.4% of patients. Poor medication adherence was observed in 38.1% of participants, with 77% exhibiting poor glycemic control (HbA1c>7%).

Table 1 shows that patients with insufficient income had the highest HbA1c scores (p=0.038). Significant differences in B-IPQ scores were found among patient groups based on diabetic medications, complications, and glycemic control (p<0.05). Patients using insulin plus OHAs, those without diabetic-related complications, and those with poor glycemic control had higher B-IPQ scores. Significant differences in MMAS-8 scores were observed among patient groups based on disease duration, family history of T2DM, and glycemic control (p<0.05). Patients with longer diabetes duration (>10 years), a family history of T2DM, and good glycemic control had higher MMAS-8 scores. Additionally, patients with longer diabetes duration (>10 years), using insulin plus OHAs, without complications, and with a family history of T2DM had higher HbA1c scores (p<0.05).

Table 2 presents descriptive statistics for the main study variables (illness perceptions, adherence to diabetes medication, and HbA1c). The mean B-IPQ score was 41.1 (SD 9.4), with hereditary factors perceived as a significant cause of T2DM by 64% of patients. The mean MMAS-8 score was 6.2 (SD 1.6), and the mean HbA1c in the study sample was 8.4% (SD 1.4).

Factors Associated with Medication Adherence and Glycemic Control (HbA1c Score)

Multivariable binomial logistic regression analysis was performed to explore factors associated with adherence to diabetes medication. Model 1 adjusted for age, gender, income, BMI, family history of T2DM, diabetes duration, complications, and smoking status, while model 2 added glycemic control and illness perception. Model 1 was not significant (X2=11.87; p=0.16), but model 2 was significant (X2=17.83;

p=0.023). A positive family history of T2DM and good glycemic control were associated with increased likelihood of optimal adherence to diabetes medication (OR=2.87; 95% CI 1.59–5.19; p<0.001, OR=5.85; 95% CI 2.53–13.5; p<0.001).

Hierarchical multiple linear regression initially adjusted for various factors, with model 1 significant (F=4.26; p<0.001; R2=0.10). Increased BMI and insulin usage alone or combined with OHAs were associated with higher HbA1c levels (β=0.17, p=0.011, 95% CI 0.01, 0.065; β = 0.27, p = < 0.001, 95% CI 0.36, 1.23). In model 2, illness perception and adherence to diabetes medication were added, resulting in a significant model (F=18.43; p<0.001, R2=0.421). Increased BMI, positive family history of T2DM, insulin usage, high illness perception, and poor medication adherence were linked to higher HbA1c levels (β=0.14, p=0.009, 95% CI 0.01, 0.05; β=0.12, p=0.028, 95% CI 0.04, 0.66; β=0.22, p=0.001, 95% CI 0.28, 0.979; β=0.12, p=0.013, 95% CI 0.004, − 0.034; β=− 0.58, p= <0.001, 95% CI − 0.60, − 0.43).

Table 1. Demographic and clinical characteristics of T2DM patients with differences in illness perception, adherence, and glycemic control (n=265)

Variables	Frequency n (%)	B-IPQ p value	MMAS-8 p value	HbA1C p value
Age				
<45	34 (12.8)	0.92	0.42	0.95
45–65	160 (60.4)			
>65	71 (26.8)			
Gender				
Male	110 (41.5)	0.708	0.72	0.19
Female	155 (58.5)			
Marital status				
Married	175 (66)	0.773	0.478	0.832
Single/widow/divorced	90 (34)			
Education status				
Illiterate/read and write	60 (22.6)	0.429	0.184	0.442
Primary/preparatory school	19 (7.2)			
Secondary school and University	186 (70.2)			
Income (patient perception)				
Sufficient income	141 (53.2)	0.098	0.911	0.038*
Insufficient income	124 (46.8)			
Smoking				
Current smoking	78 (29.4)	0.369	0.332	0.133
Non-smoking	187 (70.6)			
BMI				
Normal	25 (9.4)	0.369	0.567	0.125
Overweight	72 (27.2)			
Obese	168 (63.4)			
Duration of DM (years)				
1–4 years	64 (24.2)	0.068	0.021*	0.001*
5–10 years	88 (33.2)			
>10 years	113 (42.6)			
Medications				
OHD	64 (24.2)	0.033*	0.664	<0.001*
Insulin	88 (33.2)			
Insulin+OHAs	113 (42.6)			

Complications				
Present	117 (44.2)	0.030*	0.335	0.009*
Absent	148 (55.8)			
Family history of diabetes				
Present	160 (60.4)	0.028*	<0.001*	0.935
Absent	105 (39.6)			
Glycemic control (HbA1c)				
Good	61 (23.0)	<0.001*	<0.001*	-
Poor	204 (77.0)			
Adherence to medications				
Low adherence	101 (38.1)	0.787	-	<0.001*
Moderate adherence	78 (29.4)			
High adherence	86 (32.5)			

Table 2. Descriptive statistics of main study variables (n=265)

Variables	**Mean±SD**	**Median (IQR)**
Illness perception (B-IPQ)		
Cognitive illness representations		
1. Consequences	5.3±2.7	5 (3–7)
2. Timeline	8.2±2.5	9 (7.8–10)
3. Personal control	4.1±2.2	4 (2.8–6)
4. Treatment control	3.6±2.1	3 (2–5)
5. Identity	5.3±2.6	5 (3–7)
Emotional representations	5.2±2.8	5 (3–8)
6. Concern	4.6±2.8	4 (2–7)
8. Emotional response		
Illness comprehensibility	5.2±2.8	6 (3–8)
7. Understanding		
Total B-IPQ score	41.1±9.4	42 (34.5–47)
9. Perceived causes of T2DM		
Hereditary factors		
Psychological factors		
Behavioral factors		
Adherence to medication	6.2±1.6	7 (5–8)
HbA1c	8.4±1.4	8.3 (7.3–9.1)

Table 3. Logistic regression analysis:

Variables	**Model 1**	**Model 2**
	B (SE) Wald	B (SE) Wald
Gender (male)	-0.012 (0.40) 0.002	0.18 (0.41) 0.193
Age (years)	0.016 (0.02) 1.275	0.02 (0.02) 1.220
Income (sufficient)	0.26 (0.28) 0.836	0.32 (0.29) 1.19
BMI (continuous)	-0.014 (0.02) 0.414	-0.01 (.02) 0.095
Family history of diabetes (present)	1.06 (0.30) 12.19	0.99 (0.31) 10.2
Diabetes duration (years)	0.012 (0.03) 0.219	0.03 (0.03) 1.12
Complications (present)	0.053 (0.28) 0.037	0.18 (0.29) 0.383
Smoking (current)	-0.166 (0.41) 0.162	-0.17 (0.42) 0.169
Glycemic control (poor)	1.77 (0.43) 17.1	-
B-IPQ score	0.01 (0.02) 0.476	-

Table 4. Hierarchical linear regression with HbA1c as the dependent variable (n=265)

Variable	Model 1	Model 2
	B (SE) β (95% CI) p	B (SE) β (95% CI) p
Age	-0.01 (0.01) -0.06 (-0.03–0.01) 0.339	-0.00 (0.01) -0.01 (-0.02–0.01) 0.901
Gender	-0.11 (0.25) -0.04 (-0.59–0.38) 0.659	-0.11 (0.20) -0.04 (-0.50–0.28) 0.574
Income	0.21 (0.18) 0.07 (-0.14–0.56) 0.235	0.08 (0.14) 0.03 (-0.21–0.36) 0.590
Smoking	-0.21 (0.26) -0.07 (-0.71–0.29) 0.416	-0.09 (0.21) -0.03 (-0.50–0.31) 0.650
BMI	0.04 (0.01) 0.17 (0.01–0.07) 0.011*	0.03 (0.01) 0.14 (0.01–0.05) 0.009*
Family history of diabetes	-0.05 (0.19) -0.02 (-0.42–0.32) 0.783	0.35 (0.16) 0.12 (0.04–0.66) 0.028*
Diabetes duration (Years)	-0.01 (0.02) -0.02 (-0.04–0.03) 0.804	0.01 (0.02) 0.04 (-0.02–0.04) 0.508
Complication	-0.12 (0.18) -0.04 (-0.49–0.24) 0.500	-0.01 (0.15) -0.004 (-0.30–0.28) 0.943
Medication	0.79 (0.22) 0.27 (0.36–1.23) <0.001*	0.63 (0.18) 0.22 (0.28–0.979) 0.001*
B-IPQ score	0.02 (0.01) 0.12 (0.00–0.03) 0.013*	-
MMAS-8 score	-0.52 (0.04) -0.58 (-0.60–0.43) <0.001*	-

Discussion

Our study revealed that participants generally had a fair level of perception regarding diabetes, which was associated with complications, medication regimen, and glycemic control. Adherence to antidiabetic treatment was reported in three-fifths of the participants and was associated with diabetes duration, family history, and glycemic control. However, a significant portion of the participants failed to achieve adequate glycemic control, with higher HbA1c levels associated with factors such as higher BMI, positive family history of T2DM, insulin use, high illness perception, and poor medication adherence. (Radwan et al., 2017)

Participants in our study generally perceived T2DM as having no significant consequences on their lives, with limited control over the disease, ineffective treatment, few symptoms, and little concern or emotional attachment. These perceptions were consistent with some studies but differed from others, possibly due to socioeconomic differences and varying health systems among study populations. The total mean B-IPQ score in our study was similar to previous research. (Petricek et al., 2009)

Higher B-IPQ scores were associated with patients taking insulin plus OHAs, absence of diabetic complications, and poor glycemic control. This finding suggests that more complex medication regimens, such as insulin plus OHAs, may contribute to a greater perceived burden and negative impact on illness perception dimensions. (Ashur et al., 2015)

Adherence to diabetes medications in our study was within the range reported in previous meta-analyses, with predictors including family history of diabetes and glycemic control. However, our adherence rate was slightly lower than other studies, possibly due to differences in study settings and methodologies. (van Pufelen et al., 2015)

The majority of participants in our study had uncontrolled T2DM, possibly due to suboptimal medication adherence, therapeutic inertia, and inadequate patient training on diabetes self-care. Higher HbA1c levels

were significantly associated with factors like increased BMI, positive family history of DM, insulin use, high illness perception, and suboptimal medication adherence. (Doggrell and Warot., 2014)
In conclusion, our study highlights the importance of addressing illness perceptions, medication adherence, and glycemic control in patients with T2DM. Strategies to improve medication adherence and glycemic control are crucial for better diabetes management outcomes. Further research is needed to explore barriers to medication adherence and interventions to improve glycemic control in primary health-care settings among T2DM patients. (Broadbent et al., 2011)

Conclusion

In conclusion, the study highlights the suboptimal glycemic control among primary health-care patients with T2DM. The identified factors associated with higher HbA1c levels provide insights for further interventions and strategies aimed at improving illness perception, medication adherence, and glycemic control in this population, especially in the context of universal health coverage.

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